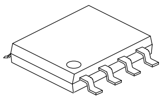
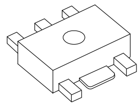
SUPER LOW ON RESISTANCE/LOW VOLTAGE 1A LDO REGULATOR



SOP-8



SOT-89-5

■ DESCRIPTION

The UTC **LR9273** is a typical LDO (linear regulator) with features of super low dropout, 1A output current capability, and -3mV typical load regulation at 1A.

During operation of the UTC **LR9273**, the dropout voltage is very low and the response of line transient and load transient are very well.

Internally, there're many functions of UTC **LR9273** which can be seen in the block figure. There are a voltage reference unit, an error amplifier, resistor-net for voltage setting, a current limit circuit, and a chip enable circuit in each UTC **LR9273**.

The UTC **LR9273** can be used as an ideal of the power supply for hand-held communication equipment, such as: power source for portable communication equipment, power source for electrical appliances, for example, cameras, VCRs and camcorders and power source for battery-powered equipment.

■ FEATURES

* Ultra Supply Current:	60μA (Typ.)
* Standby Mode:	0.1μA (Typ.)
* Very Low Dropout Voltage:	0.18V (Typ.) @I_{OUT} =1A, V_{OUT} =2.85V
* Ripple Rejection:	70dB (Typ.) @f=1kHz,V_{OUT}=2.85V
* Temperature-Drift Coefficient of Output Voltage:	±100ppm/°C (Typ.)
* Well Line Regulation:	0.02%/ V (Typ.)
* Output Voltage Accuracy:	±1.5% (Typ.)
* Internal Fold Back Protection Circuit:	250mA (Typ.) @ short mode

* C_{IN}=C_{OUT}=4.7μF or more (Ceramic capacitors) are recommended to be used with this IC

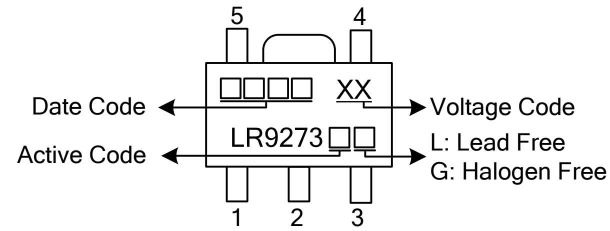
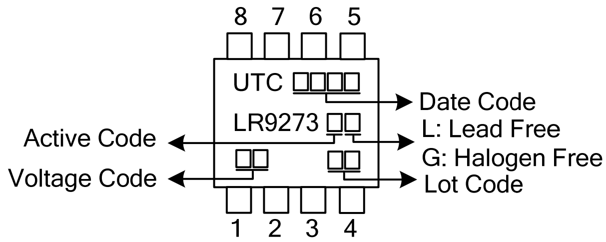
■ ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
LR9273xL-xx-S08-T	LR9273xG-xx-S08-T	SOP-8	Tube
LR9273xL-xx-S08-R	LR9273xG-xx-S08-R	SOP-8	Tape Reel
LR9273xL-xx-AB5-R	LR9273xG-xx-AB5-R	SOT-89-5	Tape Reel

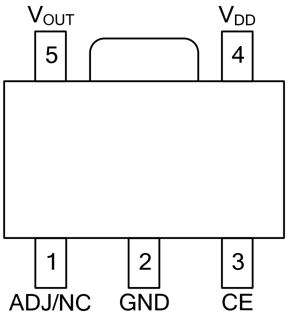
Notes: 1. x: The auto discharge function at off state are options as follows.
2. xx: Output Voltage, refer to Marking Information.

LR9273xL-xx-AF5-R (1)Packing Type (2)Package Type (3)Output Voltage Code (4)Lead Free (5)Active	(1) T: Tube, R: Tape Reel (2) S08: SOP-8, AB5: SOT-89-5 (3) xx: refer to Marking Information (4) L: Lead Free, G: Halogen Free (5) B: without auto discharge function at off state D: with auto discharge function at off state

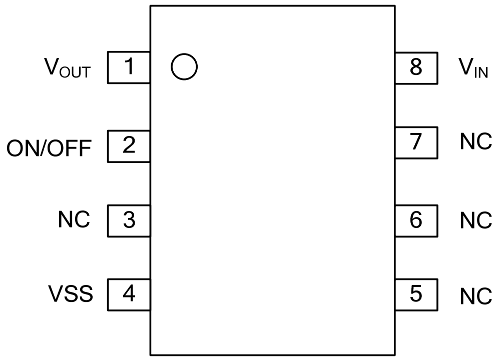
■ MARKING INFORMATION

PACKAGE	VOLTAGE CODE	MARKING
SOT-89-5	28 :2.8V 35 :3.5V AD: ADJ	
SOP-8		

■ PIN CONFIGURATION



SOT-89-5



SOP-8

■ PIN DESCRIPTION

SOT-89-5

PIN NO.	PIN NAME	DESCRIPTION
1	ADJ	ADJUST Pin (For Adjustable Version)
	NC	No Connection (For Fixed Version)
2	GND	Ground Pin
3	CE	Chip Enable Pin. Active when this Pin is high.
4	V_{IN}	Input Pin
5	V_{OUT}	Output Pin

HSOP-8J

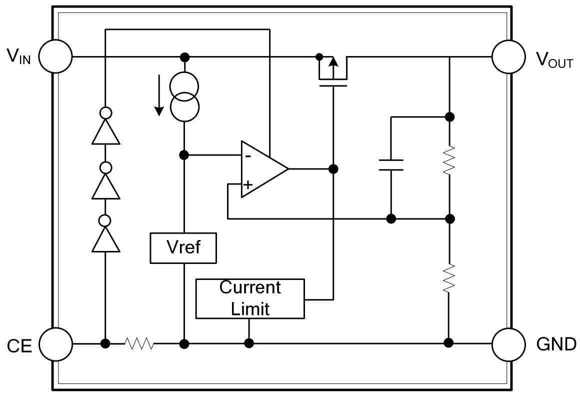
PIN NO.	PIN NAME	DESCRIPTION
1	V_{OUT}	Output Pin
2	ON/OFF	ON/OFF Pin
3, 5, 6, 7	NC	No connection (Note)
4	VSS	GND Pin
8	V_{IN}	Input Pin

Note: The NC pin is electrically open.
The NC pin can be connected to V_{IN} or V_{SS}.

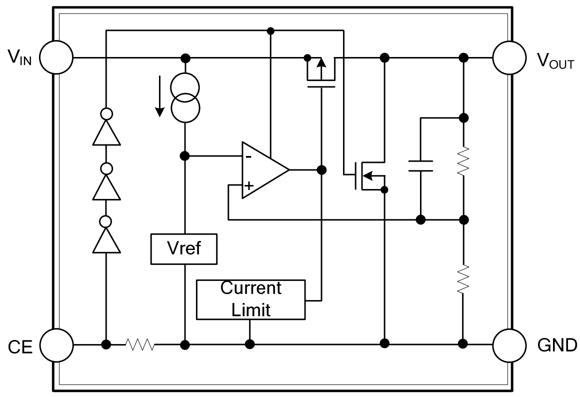
■ BLOCK DIAGRAM

For Fixed Version

UTC LR9273B-xx

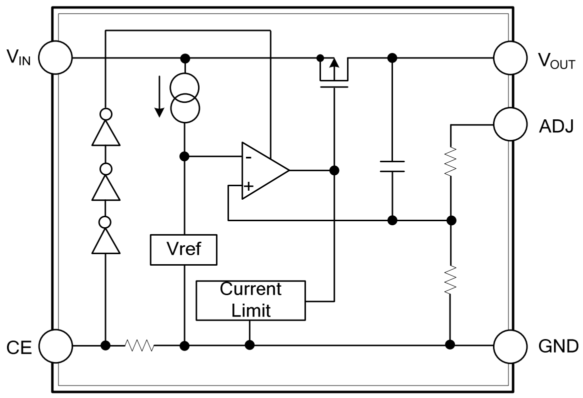


UTC LR9273D-xx

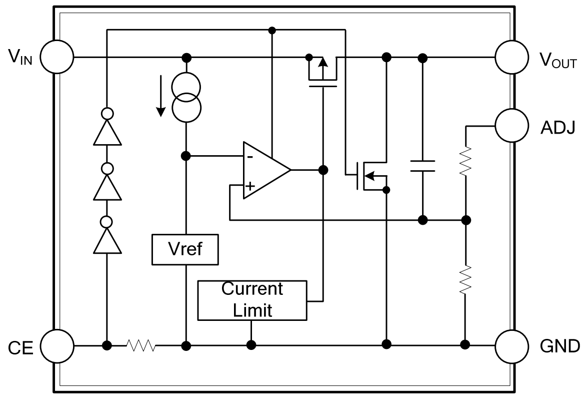


For Adjustable Version

UTC LR9273B-AD



UTC LR9273D-AD



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	RATINGS	UNIT
Input Voltage	V_{IN}	6.5	V
Input Voltage (CE Pin)	V_{CE}	-0.3~6.5	V
Output Voltage	V_{OUT}	-0.3~ V_{IN}+0.3	V
Power Dissipation	P_D	900	mW
Operating Temperature	T_{OPT}	-40~+85	°C
Storage Temperature	T_{STG}	-55~+125	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged.
Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ ELECTRICAL CHARACTERISTICS

LR9273B/D-xx (Fixed Output Voltage Type)

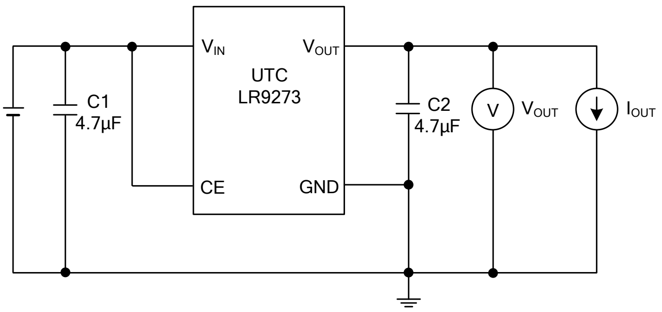
PARAMETER	SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input Voltage	V_{IN}			1.4		6.0	V
Supply Current	I_{SS}	$V_{IN}-V_{OUT}$=1.0V, $V_{CE}=V_{IN}$, I_{OUT}=0A			60	100	μA
Standby Current	Istandby	V_{IN}=6.0V, V_{CE}=0V			0.1	1.0	μA
Output Voltage	V_{OUT}	$V_{IN}-V_{OUT}$=1.0V, I_{OUT}=100mA	V_{OUT}>1.5V	×0.98		×1.02	V
			V_{OUT}≤1.5V	-30		+30	mV
Load Regulation	$\Delta V_{OUT}/\Delta I_{OUT}$	$V_{IN}-V_{OUT}$=0.3V, 1mA≤I_{OUT}≤300mA, If V_{OUT}≤1.1V, then V_{IN}=1.4V		-15	-2	15	mV
		$V_{IN}-V_{OUT}$=0.3V, 1mA≤I_{OUT}≤1A, If V_{OUT}≤1.1V, then V_{IN}=1.7V			-3		mV
Dropout Voltage (T_{OPT}=25°C)	V_{DIF}	I_{OUT}=300mA	0.8≤V_{OUT}<0.9		0.33	0.57	V
			0.9≤V_{OUT}<1.0		0.22	0.47	V
			1.0≤V_{OUT}<1.5		0.18	0.32	V
			1.5≤V_{OUT}<2.6		0.10	0.15	V
			2.6≤V_{OU}		0.05	0.10	V
		I_{OUT}=1A	0.8≤V_{OUT}<0.9		0.72		V
			0.9≤V_{OUT}<1.0		0.64		V
			1.0≤V_{OUT}<1.5		0.56		V
			1.5≤V_{OUT}<2.6		0.32		V
			2.6≤V_{OU}		0.18		V
Line Regulation	$\Delta V_{OUT}/\Delta V_{IN}$	I_{OUT}=100mA, V_{OUT}+0.5V≤V_{IN} ≤6.0V, If V_{OUT}≤0.9V, 1.4V≤VIN≤6.0V			0.05	0.20	%/V
Ripple Rejection	RR	f=1kHz (V_{OUT}≤4.0V)			70		dB
		f=1kHz (V_{OUT}>4.0V) Ripple 0.5Vp-p,$V_{IN}-V_{OUT}$=1.0V, I_{OUT}=100mA, If V_{OUT}≤1.2V, $V_{IN}-V_{OUT}$=1.5V, I_{OUT}=100mA			60		dB
Output Voltage Temperature Coefficient	$\Delta V_{OUT}/\Delta T_{OPT}$	I_{OUT}=100mA, -40°C≤T_{OPT}≤85°C			±100		ppm/°C
Output Current	I_{LIM}	V_{IN}-V_{OUT}=1.0V		1			A
Short Current Limit	I_{SC}	V_{OUT}=0V			250		mA
Pull-Down Resistance for CE PIn	R_{PD}			1.9	5.0	15.0	MΩ
CE Input Voltage High	V_{CEH}			1.0		6.0	V
CE Input Voltage Low	V_{CEL}			0		0.4	V
Thermal Shutdown Detector Threshold Temperature	T_{TSD}	Junction temperature			150		°C
Thermal Shutdown Released Temperature	T_{TSR}	Junction temperature			120		°C
Output Noise	en	BW=10Hz~100kHz			30		μVrms

■ ELECTRICAL CHARACTERISTICS

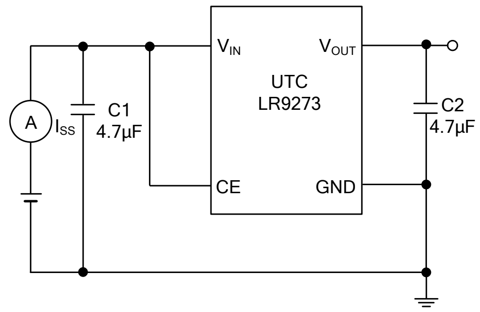
LR9273B/D-xx (Adjustable Output Voltage Type)

PARAMETER		SYMBOL	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Input Voltage		V_{IN}			1.4		6.0	V
Supply Current		I_{SS}	$V_{OUT}=V_{ADJ}$, $V_{IN}=2.0$, $V_{CE}=V_{IN}$			60	100	μA
Standby Current		Istandby	$V_{IN}=6.0V$, $V_{CE}=0V$			0.1	1.0	μA
Reference Voltage for Adjustable Voltage Regulator		V_{OUT}	$V_{OUT}=V_{ADJ}$, $V_{IN}=2.0V$, $I_{OUT}=100mA$		0.970	1.000	1.030	V
Output Voltage Range		RV_{OUT}			1.0		V_{IN}	V
Load Regulation		$\frac{\Delta V_{OUT}}{\Delta I_{OUT}}$	$V_{IN}=1.4V$, $1mA \le I_{OUT} \le 300mA$		-15	-2	15	mV
			$V_{IN}=1.7V$, $1mA \le I_{OUT} \le 1A$			-3		mV
Dropout Voltage		V_{DIF}	$V_{OUT}=V_{ADJ}$	$I_{OUT}=300mA$		0.18	0.32	V
				$I_{OUT}=1A$		0.56		V
Line Regulation		$\frac{\Delta V_{OUT}}{\Delta V_{IN}}$	$V_{OUT}=V_{ADJ}$, $I_{OUT}=100mA$, $1.5V \le V_{IN} \le 6.0V$			0.05	0.20	%/V
Ripple Rejection		RR	f=1kHz Ripple 0.5Vp-p, $V_{OUT}=V_{ADJ}$, $V_{IN}=2.5V$, $I_{OUT}=100mA$			70		dB
Output Voltage Temperature Coefficient		$\frac{\Delta V_{OUT}}{\Delta T_{OPT}}$	$I_{OUT}=100mA$, $-40°C \le T_{OPT} \le 85°C$			±100		ppm/°C
Output Current		I_{LIM}	$V_{OUT}=V_{ADJ}$, $V_{IN}=2.0$		1			A
Short Current Limit		I_{SC}	$V_{OUT}=V_{ADJ}=0V$			250		mA
Pull-Down Resistance for CE PIn		R_{PD}			1.9	5.0	15.0	MΩ
CE Input Voltage	High	V_{CEH}			1.0		6.0	V
	Low	V_{CEL}			0		0.4	V
Thermal Shutdown Detector Threshold Temperature		T_{TSD}	Junction temperature			150		°C
Thermal Shutdown Released Temperature		T_{TSR}	Junction temperature			120		°C
Output Noise		en	BW=10Hz~100kHz			30		μVrms

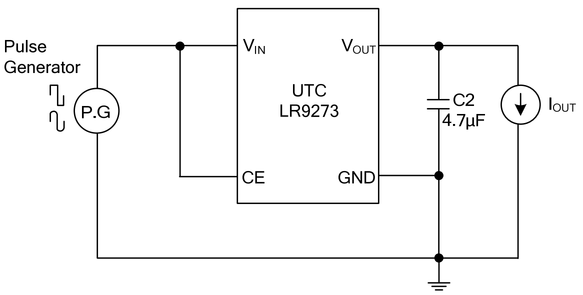
■ TEST CIRCUIT



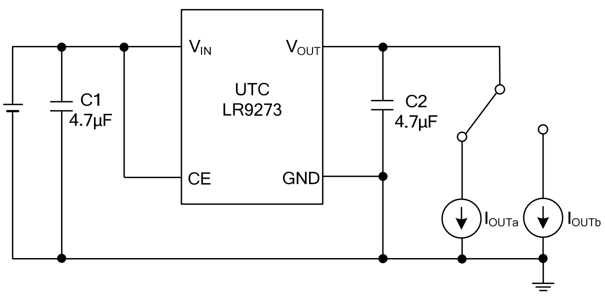
Basic Test Circuit



Test Circuit for Supply Current

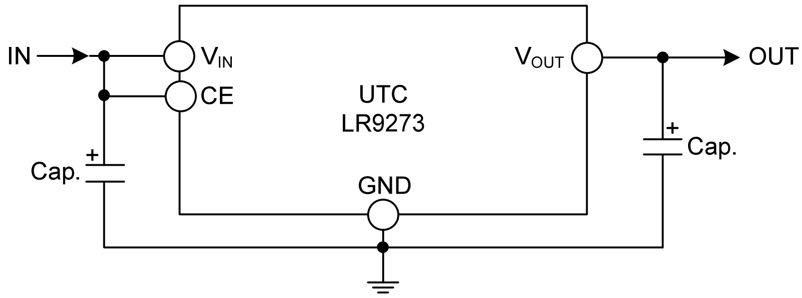


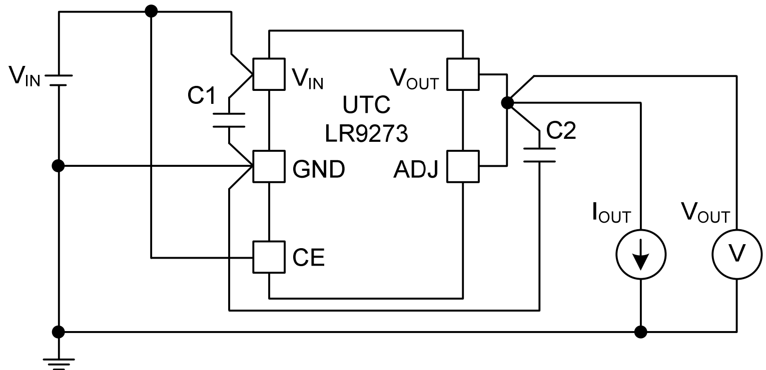
Test Circuit for Ripple Rejection



Test Circuit for Load Transient Response

■ TYPICAL APPLICATION CIRCUIT





Example of the Typical Application of UTC **LR9273** (Fixed Output Type)

Phase Compensation

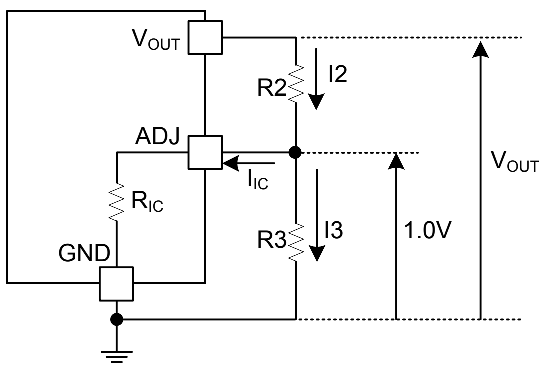
In these ICs, phase compensation is made with the output capacitor for securing stable operation even if the load current is varied. For this purpose, use as much as a capacitor as C2. Recommendation value is as follows:

Mounting on PCB

Make V_{DD} and GND lines sufficient. If their impedance is high, a current flows, the noise picked up or unstable operation may result. Further use a 4.7μF or more value capacitor between V_{DD} pin and GND pin as close as possible.

Set an Output capacitor between V_{OUT} pin and GND pin for phase compensation as close as possible.

Technical Notes on Output Voltage Setting of Adjustable Output type



■ TYPICAL APPLICATION CIRCUIT(Cont.)

The Output Voltage may be adjustable for any output voltage between its 1.0V reference and its V_{DD} setting level. An external pair of resistors is required, as shown above.

The complete equation for the output voltage is described step by step as follows;

$I2=I_{IC}+I3$ ………… (1)

$I3=1.0/R3$ ………… (2)

Thus,

$I2=I_{IC}+1.0/R3$ ………… (3)

Therefore,

$V_{OUT}=1.0+R2\times I2$ ………… (4)

Put Equation (3) into Equation (4), then

$V_{OUT}=1.0+R2(I_{IC}+1.0/R3)$

$=1.0(1+R2/R3)+R2\times I_{IC}$ ………… (5)

In 2nd term, or R2×IIC will produce an error in VOUT.

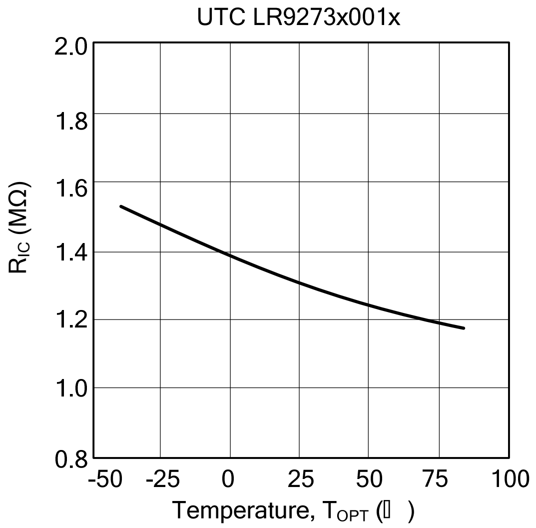
In Equation (5),

$I_{IC}=1.0/_{RIC}$ ………… (6)

$R2\times I_{IC}=R2\times 1.0/R_{IC}$

$=1.0\times R2/R_{IC}$ ………… (7)

For better accuracy, choosing R2(<<RIC) reduces this error.



The graph is a typical characteristic , please evaluate the circuit with an actual condition.